

# BDM SUBCONTRACT FACT SHEET

**CONTRACT TITLE:** Research and Development of Advanced Fracture Modeling in the Unita Basin for Optimized Primary and Secondary Recovery

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| <b>ID NUMBER:</b> G4S51729                                    | <b>CONTRACT PERFORMANCE PERIOD</b>  |
| <b>Related WA #:</b> 95-A01                                   | 03/29/1996 to 04/07/1998  |
| <b>DOE MONITOR</b>  | <b>PERFORMER</b>  |
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| <b>BDM TECHNICAL MANAGER</b>                                  | <b>CONTACT:</b> John McLennau<br><b>ADDRESS:</b> Terra Tek<br>400 Wakara Way<br>Salt Lake City, UT 84108<br><b>PHONE:</b> (801) 584-2474<br><b>FAX:</b> |

| FUNDING (1000's)  | BDM SHARE | OTHER SHARE | TOTAL |
|-------------------|-----------|-------------|-------|
| PRIOR FISCAL YRS  | 483       | 777         | 1,260 |
| FISCAL YR 1998    | 261       | 0           | 261   |
| FUTURE FUNDS      | 0         | 0           | 0     |
| TOTAL EST'D FUNDS | 744       | 777         | 1,521 |

## PROJECT DESCRIPTION:

This project presents two new and innovative engineering models for the analysis of naturally fractured reservoirs. The first model will improve recovery predictions during the primary phase of production, which the second model will improve recovery predictions during secondary recovery (waterflood). Both models incorporate key data from geological and geophysical studies to provide a multidisciplinary approach to improved oil recovery from naturally fractured reservoirs. These new models provide a significant improvement in predicting naturally fractured reservoir behavior, and bridge the gap between the overly simplistic nonfractured reservoir models and the overly complex numerical simulation models.

**Accomplishments:**

Bruhn, R.L., D. Bering, S.R. Bereskin, C. Magnus and A. Fritsen, Field Observations and Permeability Modeling of Fracture Networks in Hydrocarbon Reservoirs, paper 041, In. J. Rock Mechanics and Mining Sci. 34, NO. 3-4, 1997. Brown, S. R. and R. L. Bruhn, Permeability of Deformable Fracture Networks, J. Geophys. Res., in press.

Bereskin, S. R., R. L. Bruhn, A. Groeger, A., and B. A. Marin, Correlation of Fractured Surface Exposure to Aberrant Oil Production Along the Duchesne Fault Zone, Northeastern Utah, Natural Fracture Systems in the Southern Rockies, J.C. Close and T. A. Casey (eds), Four Corners Geological Society, Durango, CO (1997).

Bereskin, S. R., M. C. Walters, B. A. Marin, R. L. Bruhn and A. Y. Groeger, Kinetic Evolution of Structures influencing Hydrocarbon Migration and Production in Economically Unpredictable Reservoirs: Duchesne Fault Zone, Uinta Basin presented at the Rocky Mountain Association of Geologists Fractured Reservoir Symposium, January 19-20, 1998, in Denver, Colorado.

The Importance of Surface Geology to Subsurface Production - A Partial Answer to Willy-Nilly Drilling in Mature Basins, to be presented at the AAPG Annual Convention, May 19, 1998, Salt Lake City, Utah.

(1) Simple, specific and concrete suggestions for improved exploration and exploitation have been developed and communicated to the industry. (2) The University of Utah has developed numerical methods for modeling stress-sensitive permeability associated with two- and three-dimensional fracture networks. (3) A three-dimensional fractured reservoir visualization model has been developed. (4) Data have been generated (field and laboratory) for the numerical models. (5) Basin scale numerical modeling, using Discontinuous Deformation Methods has been implemented and is defining "sweet spots" in the field preferred drilling.